

IN THE CLAIMS:

Please cancel claims 6-9.

Please amend claims 1, 3, 10, 16, 19 and 20 as follows:

Sub C2
1. (Twice Amended) A direct injection fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector comprising:

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a body having an inlet portion, an outlet portion, a neck portion disposed between the inlet portion and the outlet portion, the neck portion including a cylindrical annulus that provides a body passage extending from the inlet portion to the outlet portion along the longitudinal axis of the fuel injector;

an armature proximate the inlet portion of the body;

a cylindrical needle operatively connected to the armature;

a seat protruding from the outlet portion of the body; and

a swirl generator proximate the seat;

wherein the cylindrical annulus of the body includes an inner diameter that is greater than a diameter of the cylindrical needle so as to define the body passage, which maintains an operative relationship between the body and the needle when the body is exposed to operating temperatures of a cylinder of an engine.

Sub C3
3. (Twice Amended) A direct injection fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector comprising:

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a body having an inlet portion, an outlet portion, a neck portion disposed between the inlet portion and the outlet portion, the neck portion including a cylindrical annulus that provides a body passage extending from the inlet portion to the outlet portion along the longitudinal axis of the fuel injector;

an armature proximate the inlet portion of the body;

a cylindrical needle operatively connected to the armature;

a seat protruding from the outlet portion of the body; and

a swirl generator proximate the seat;

B3 wherein the cylindrical annulus of the body includes an inner diameter that is greater than a diameter of the cylindrical needle so as to define the body passage, which maintains an operative relationship between the body and the needle when the body is exposed to operating temperatures of a cylinder of an engine, and wherein the seat includes a first surface exposed to the fuel passageway and a second surface exposed to an exterior of the fuel injector, the first surface being spaced from the second surface a defined distance along the longitudinal axis, the first surface having at least one cut-out configuration that extends for a fraction of the defined distance into an interior of seat.

SubA 10. (Amended) A fuel injector having a fuel inlet, a fuel outlet, and a fuel passageway extending from the fuel inlet to the fuel outlet along a longitudinal axis, the fuel injector comprising:

a body having an inlet portion, an outlet portion, and a body passage extending from the inlet portion to the outlet portion along the longitudinal axis;

an armature proximate the inlet portion of the body;

a needle operatively connected to the armature, the needle includes a curved surface that engages with a conical end of the funnel to inhibit fuel flow through the seat passage of the seat;

a swirl generator proximate the needle, the swirl generator comprises at least one flat disk, the at least one flat disk includes:

B4 a guide disk having a perimeter, a central aperture, and at least one fuel passage opening between the perimeter and the central aperture; and

a swirl disk having at least one slot extending tangentially from the at least one fuel passage opening to the central aperture;

a seat protruding from the outlet portion of said body, the seat including a first surface exposed to the body passage and a second surface exposed to an exterior of the fuel injector, the first surface being spaced from the second surface a defined distance along the longitudinal axis, the first portion having at least one cut-out configuration that extends from the first surface for a fraction of the defined distance into an interior of seat wherein the at least one cut-out comprises at least one volume that defines at least one wall in the interior of the seat, the at least one volume comprises one of a plurality of volumes and a channel, wherein the seat includes a seat

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passage, the seat passage including a funnel extending between the first surface and the second surface.

Sub F13
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16. (Amended) The fuel injector of claim 10, wherein the channel comprises a width on the first surface, and wherein each of the plurality of fuel passage openings comprises a circular aperture with a diameter, the diameter of one of the fuel passage openings being substantially equal to the width of the channel.

Sub A1
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19. (Amended) The fuel injector of claim 10, wherein the body comprises a neck portion, the neck portion including a cylindrical annulus that surrounds the needle, the needle being a substantially cylindrical needle; and

wherein the cylindrical annulus comprises an inner diameter and an outer diameter, the inner diameter that is no more than 50% greater than a diameter of the cylindrical needle, and an outer diameter that is no less than 100% greater than the inner diameter.

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20. (Twice Amended) A method of stabilizing temperature of a direct injection fuel injector, the fuel injector having a body; an armature proximate an inlet of the body; a needle operatively connected to the armature; a seat disposed at the outlet of the body; and a swirl generator proximate the seat, the method comprising:

providing the needle with a substantially uniform cross-sectional area; and
selecting the body to surround the needle and form a body passage, the body passage maintains an operative relationship between the body and the needle so that fuel in the body passage transfers heat from the body to the needle to maintain a minimum temperature gradient and to maintain an operative relationship between the body and the needle when the body is exposed to operating temperatures of an engine cylinder.